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The TURNIP APHID

IN THE SOUTHERN STATES AND METHODS FOR ITS CONTROL

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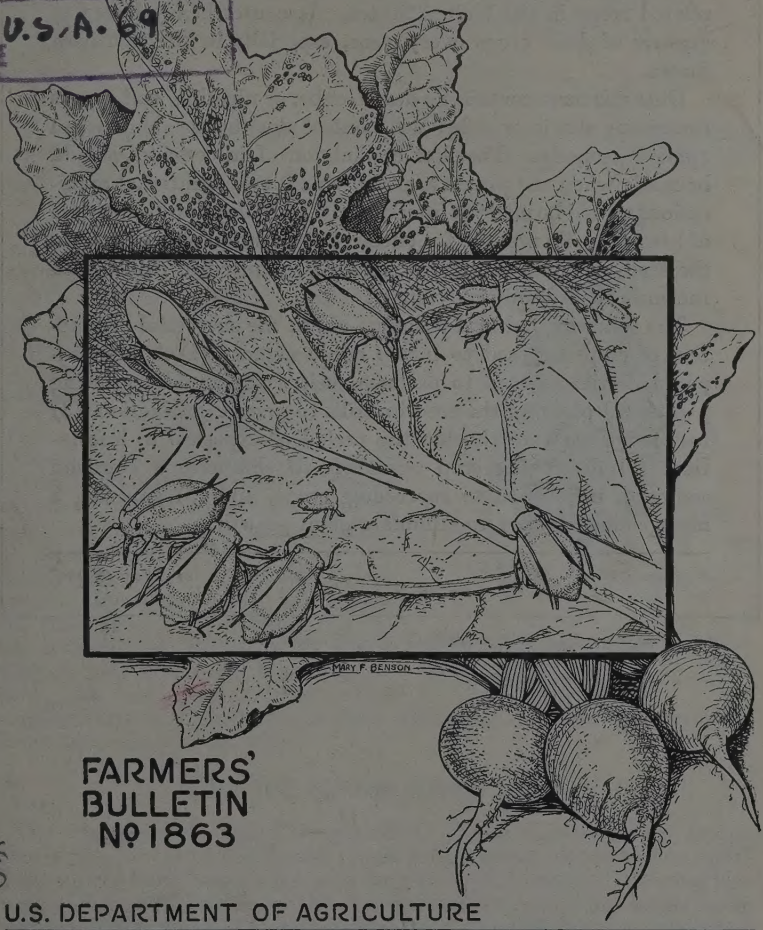

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THE TURNIP APHID is one of the most destructive and widely distributed pests of turnip, mustard, radish, and related crops in the United States. It causes heavy losses to growers of these crops every year, especially in the Southern States.

Dust mixtures containing derris, cube, or nicotine, and sprays containing derris or cube, will control the turnip aphid when applied properly. The first application of insecticides should be made when the plants are very small, and additional applications should be made at intervals of 7 to 14 days up to the time of harvest. To provide for effective application of insecticides, the seed of susceptible crops should be planted in drills, with the rows spaced uniformly apart.

The following cultural practices aid in the successful production of crops exposed to turnip aphid attack: (1) A well-prepared, fertile seedbed to produce thrifty and rapidly growing plants, (2) planting the seed in drills to permit cultivation, (3) harvesting early to shorten the period of exposure to infestation, (4) destroying crop remnants to eliminate a common source of infestation to succeeding crops, and (5) applying a nitrogenous fertilizer to stimulate plant growth.

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THE TURNIP APHID IN THE SOUTHERN STATES AND METHODS FOR ITS CONTROL

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The turnip aphid (*Rhopalosiphum pseudobrassicae* (Davis)), which attacks turnip, mustard, radish, and related crops, is widely distributed in the United States and causes heavy losses to growers of these crops every year, especially in the South. According to estimates, the average annual loss in Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, and South Carolina amounts to $2,800,000.

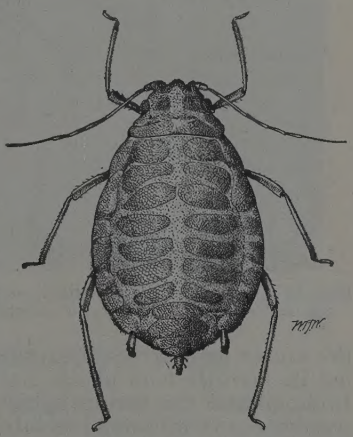

FIGURE 1.—Wingless female adult, or parent, of the turnip aphid; about 25 times natural size. (Davis.)

WHAT THE TURNIP APHID LOOKS LIKE

The turnip aphid is a very small, soft-bodied insect, green, or green and black, about one-sixteenth of an inch long when fully grown. The full-grown aphids, or "lice," are usually present on the plants in two forms. One form (fig. 1) is wingless and pale green. The other (fig. 2) has transparent wings, with black veins, is pale green and black on the body, and has a black head. The wingless form is slightly longer than wide, and the form with wings is about twice as long as wide.

HOW THE TURNIP APHID LIVES

The female turnip aphid gives birth to young directly on the under sides of the leaves of the turnip plant, many being placed in one spot. These newly born insects are very tiny but grow rapidly. During the process of growth they shed the skin several times and get larger each time the skin is shed. On an average only 10 or 12 days are required for the aphids to reach full growth and begin bearing young for another

generation. In the Gulf coast region there may be from 15 to 46 generations in a year. Each full-grown aphid gives birth to from 50 to 100 young, on an average, over periods ranging from 20 to 30 days.

If weather conditions are favorable, each aphid may live as long as 2 months. Since all the aphids are females, this insect, unless held in check by control measures or natural enemies, increases in numbers very rapidly, when plenty of food is available and when weather conditions are suitable for its development.

Although in Louisiana and similar territory along the Gulf coast and in the south Atlantic region the turnip aphid is present throughout the year, it thrives best and causes most damage late in the fall, during

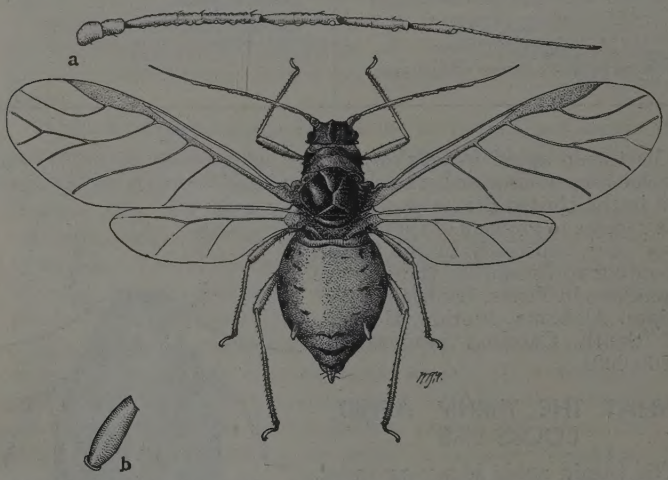

FIGURE 2.—Winged female adult, or parent, of the turnip aphid; about 25 times natural size. *a*, Antenna; *b*, cornicle; *a* and *b* greatly enlarged. (Davis.)

the winter, and early in the spring. This is also the best time for growing its favorite food plants, such as turnips, mustard, and radishes. In Louisiana the turnip aphid frequently is present in destructive numbers in October and as late as April, but it is most abundant in November, December, January, February, and March.

Early in the fall, when the fall crops of its food plants are being sown, many of the progeny of the wingless form develop wings. These winged turnip aphids fly to turnips, mustards, radishes, or other hosts and deposit newly born aphids on them as soon as the plants appear above ground. These aphids form the source, or beginning, of new infestations. Then a succession of many generations of winged and wingless aphids develop throughout the remainder of the fall, during the winter, and early in the spring. A greater proportion of the winged form is again produced late in the spring, but this is at a time when its favorite cultivated host plants are both scarce and in poor condition. These scattered cultivated host plants and some wild plants serve as summer hosts, but investigators have not been able to show that this accounts for all of the fall population.

FEEDING HABITS OF THE TURNIP APHID AND CHARACTER OF ITS INJURY

The aphids injure the plants by sucking the juices, and they prefer young plants or the new growth of older plants upon which to feed. They concentrate largely on the under side of the leaves. Usually the first noticeable sign of an infestation is the curling of the leaves. If the plants are heavily infested when very young, they may soon be stunted or even killed. On the larger heavily infested plants the leaves curl and turn yellow, and the plants may die (fig. 3).

FIGURE 3.—A field of mustard, nearly ready to harvest, injured severely by the turnip aphid.

NATURAL ENEMIES OF THE TURNIP APHID

The turnip aphid has a number of natural enemies, including parasitic and predacious insects, fungous diseases, and birds. Although these are valuable aids in controlling this pest, it is necessary to apply artificial control measures to produce crops successfully, especially during the period when the aphid is most abundant.

INSECTICIDES FOR TURNIP APHID CONTROL

Dust mixtures containing derris, cube, or nicotine, and sprays containing derris or cube, will control the turnip aphid when applied properly (fig. 4). The roots of derris and cube are imported from several tropical and semitropical countries, and one of the important killing agents in the powder made from them is rotenone. The rotenone content of the ground derris or cube root varies, but much of the supply on the market is blended in such a manner as to contain approximately 4 or 5 percent of rotenone. From the evidence at hand, the insecticides made from the ground roots of derris or cube,

when applied at the dosages recommended in this bulletin, should not leave harmful residues on the market product. The active principles of these materials are rendered inert within a comparatively short time through the action of sunlight and exposure to the air, especially when they are spread thinly over the plants.

Although factors of natural control such as unfavorable weather conditions, parasites, and predators may at times reduce the numbers of the turnip aphid to such an extent that this pest causes no serious damage, these influences should not be depended on to displace insecticidal treatments.

DERRIS OR CUBE DUST MIXTURE

A derris or cube dust mixture containing 1 percent of rotenone, made by diluting the powdered root with equal parts of finely ground

FIGURE 4.—A field of mustard grown for greens or salad showing damage caused by the turnip aphid to the plants in the area, untreated with insecticide, inside the four stakes shown in the photograph. The plants to the left and right and at the back of the untreated area were protected by applications of a dust mixture containing derris.

tobacco dust and sulfur, is recommended for the control of the turnip aphid. This insecticide is effective against the turnip aphid; and, although it is comparatively slow in its action, it continues to be effective for several days after it is applied.

Susceptible crops, such as turnips, mustard, and radishes, are subject to turnip aphid attack and serious damage from the time they appear above ground. It is very important, therefore, that the first application of the insecticide be made to the plants when they are very small (fig. 5). Additional applications should be made at intervals of 7 to 14 days up to the time of harvest. If the first application is delayed (fig. 6) until after the plants have become severely injured by the aphid, such plants may be killed or stunted, in which case

control not only becomes more difficult and expensive, but the production of a profitable crop may be impossible. In the areas of the South in which winter vegetables are produced, two or three applications of the dust mixture are usually required to protect a crop of

FIGURE 5.—Make the first application of insecticides for turnip aphid control when the plants reach this stage of growth. About twice natural size.

FIGURE 6.—When the first application of insecticides for turnip aphid control is delayed until the plants reach this stage of growth, the infested plants may be killed or stunted to such an extent as to prevent the production of a profitable crop. Infested mustard plant at left; noninfested mustard plant of same age at right. About twice natural size.

radishes from damage by the turnip aphid, three or four applications for mustard, and five or six applications for turnips. When the duration of the period required for the development of the crop is prolonged by unfavorable growing conditions, especially by periods of low temperature, at which time the aphid is usually most destructive, additional applications may be required.

For best results the derris or cube dust mixture should be applied late in the afternoon, early in the evening, or early in the morning, while the atmosphere is calm and preferably while the plants are moist. Furthermore, the dust mixture should be applied in such a way (fig. 7) that all the plants will be thoroughly covered, especially the under sides of the leaves where most of the aphids are usually concentrated. As the thoroughness with which the insecticide is applied is a most important factor in control, it is a good plan to examine the plants from time to time when they are being treated, to be sure that the insecticide is reaching the insects. Quantities of

FIGURE 7.—Method of applying with a hand duster dust mixtures for the control of the turnip aphid. Planting susceptible crops, such as turnips, mustard, and radishes, in two drills 8 to 10 inches apart, in straight rows spaced uniformly 3½ to 4 feet apart, aids greatly in the effective application of the insecticide.

the dust mixture ranging from 15 to 30 pounds per acre per application, depending on the size of the plants, are usually required. The best results can be accomplished with dusting machines operated by hand, with power dusters, or with traction dusters. A satisfactory method for application by hand dusters is illustrated in figure 7.

This dust mixture, when applied according to the schedule recommended for the turnip aphid, also affords protection from certain species of leaf-feeding insects [1] which often feed on turnips or mustard and detract from the market value of these vegetables as greens or salad. This protection is another reason for using the dust mixture.

[1] Notably the striped flea beetle (*Phyllotreta vittata* (F.)), the imported cabbage worm (*Pieris rapae* (F.)), the cabbage looper (*Autographa brassicae* (Riley)), and the diamondback moth (*Plutella maculipennis* (Curt.)). The vegetable weevil (*Listroderes obliquus* (Klug)) can also be included in this group, although under ordinary conditions the application of insecticides containing rotenone will not control infestations of the large larvae or the adults of this species. This further emphasizes the importance of early treatments.

HOW TO PREPARE THE DERRIS OR CUBE DUST MIXTURE

The derris or cube dust mixture consists of the finely ground root of derris or cube diluted with equal parts, by weight, of finely ground tobacco dust and dusting sulfur. Hydrated lime should not be used as a diluent on account of its unfavorable action on derris and cube.

To prepare a derris or cube dust mixture containing 1 percent of rotenone, use the following formula:

Derris or cube powder (4 percent rotenone content), 25 pounds (1 part by weight).
Finely ground tobacco dust, 37½ pounds (1½ parts by weight).
Dusting sulfur (300-mesh), 37½ pounds (1½ parts by weight).

If the rotenone content of the derris or cube powder is greater or less than 4 percent, the proportions of the diluent should be varied accordingly. For example, a derris or cube powder containing 5 percent of rotenone should be mixed with 2 parts of each of the diluents by weight, that is, 20 pounds of the derris or cube powder containing 5 percent of rotenone and 40 pounds of each of the diluents, to obtain a dust mixture containing 1 percent of rotenone.

Home-prepared derris or cube dust mixtures may be mixed satisfactorily and conveniently in a tightly constructed drum or barrel having a 10-gallon capacity in which have been placed 8 or 10 stones, each about the size of a baseball. In the preparation of such a dust mixture the ingredients are first placed in the drum or barrel to about two-thirds of its capacity. The stones are then added, the lid is closed tightly, and the drum or barrel is rolled slowly on the ground for about 5 minutes, back and forth, or for a total distance of 400 to 500 feet. The drum or barrel should be turned end over end at frequent intervals to aid in the mixing process. If it is desired to use a container having more than a 10-gallon capacity, it will be necessary to use a larger number of stones, the exact number being determined by the experience of the operator. In any event the operator should examine a small handful of the dust mixture at the expiration of the 5-minute mixing period. If the mixture has any lumps in it or has a streaked appearance, the procedure of mixing should be repeated until the ingredients are mixed thoroughly.

Ready-mixed derris or cube dust mixtures may be bought under several trade names, but these are usually more expensive than the home-prepared dust mixtures. The purchaser intending to use such dust mixtures against the turnip aphid should make certain that they contain at least 1 percent of rotenone.

NICOTINE DUST MIXTURE

A dust mixture containing 3 percent of nicotine, with hydrated lime as a diluent, may be used under some circumstances for the control of the turnip aphid. It may be used to advantage, however, only when the temperatures are above approximately 60° F. and when the plants are dry. It should not be used if the leaves of the treated plants are to be harvested within the next few days, on account of the possibility of undesirable residues remaining on the treated leaves. When used under the favorable conditions just described, the nicotine dust mixture will materially reduce the turnip aphid population within a short time after it is applied. It should be applied in the same manner and at the same rate and time intervals as recommended for the derris or cube dust mixture.

To prepare a dust mixture containing 3 percent of nicotine, use the following formula:

Total quantity (pounds) desired	Pounds of 40-percent nicotine sulfate	Pounds of hydrated lime
100	7½	92½
40	3	37
10	¾	9¼
2½	3/16	2 5/16

The home-prepared dust mixture may be mixed by following the method that has been described for the preparation of the derris or cube dust mixture, but special care should be taken to make sure that the nicotine is evenly distributed throughout the mixture.

DUSTING EQUIPMENT

Hand dusters may be used to apply the dust mixtures where the acreage is not too large. Power dusters or traction dusters should be used for fields exceeding approximately 5 acres in size.

FIGURE 8.—Proper arrangement of outlets on a power duster to insure that all the plants are covered thoroughly by the insecticide. Rows of plants should be as straight as practical and a uniform distance apart to make certain that all the plants are treated.

DERRIS OR CUBE SPRAYS

Where a grower has no dusting equipment, but does have spraying equipment, he may use a spray containing cube or derris instead of the dust mixture containing these ingredients. Good results in controlling the turnip aphid have been obtained with a spray consisting of 2 pounds of finely ground derris or cube root (containing from 4 to 5 percent of rotenone) to 50 gallons of water, applied at the rate of 100 to 125 gallons per acre per application, at the same intervals recommended for the dust mixture. The spray mixture should be applied when the plants are dry, preferably late in the afternoon.

AIDS TO THE APPLICATION OF INSECTICIDES

To provide for effective applications of insecticides, the seed of susceptible crops should be planted in two drills 8 to 10 inches apart, with the rows spaced uniformly 3½ to 4 feet apart (fig. 7). When a power duster or sprayer or a traction duster or sprayer is to be used, the rows of plants must be as straight as practical and a uniform distance apart in order that the outlets, or nozzles, on the duster or sprayer may be so arranged (fig. 8) that each row of plants will be thoroughly covered by the insecticide. If the rows are crooked or are spaced unequally, some of the plants will be missed by the insecticide.

To obtain the most effective control of the turnip aphid, **the seed should not be broadcast in the fields**, for the following reasons: (1) Plants resulting from broadcast seeding produce spreading leaves which favor the insect and hinder the application of insecticides; and (2) large quantities of insecticides are necessary for an effective application on plants from broadcast seedings, and this makes the cost excessive.

CULTURAL PRACTICES FOR TURNIP APHID CONTROL

For the successful production of crops exposed to attack by the turnip aphid, the plants must be kept growing rapidly from the time they come up until they are harvested. The first requirement for this thrifty condition of the crop is a well-prepared, fertile seedbed. Also, the practices described below aid greatly in successful crop production when there are turnip aphid infestations.

(1) Plant the seed in drills. This not only provides favorable conditions for applying insecticides, as discussed previously, but it permits cultivation, which helps to conserve soil moisture during dry weather, it stimulates plant growth, and it hastens maturity, thus aiding in the reduction of damage by the turnip aphid. The practice of planting in drills also tends to produce erect plants, when good stands are obtained, thus permitting a more effective application of insecticides.

(2) Harvest the crops as soon as they are ready for market. This shortens the period during which insecticidal protection must be provided and reduces the cost of keeping the turnip aphid under control. Also, harvest the crops cleanly so as to eliminate all aphid food plants that would otherwise be left in the field.

(3) Destroy crop refuse immediately by feeding it to livestock or by plowing it under. This eliminates a common source of the winged form of the aphid, which ordinarily flies to and infests young crops in the vicinity.

(4) Apply a readily available nitrogenous fertilizer at the rate of 100 to 200 pounds per acre soon after the plants come above the soil surface. This increases the rate of plant growth at a time when the plants are most likely to be seriously injured or killed by the turnip aphid and aids them in escaping serious injury.

WHERE TO GET THE INSECTICIDES

If the insecticides mentioned in this bulletin cannot be obtained from local dealers in agricultural supplies, from local seed stores, or from general stores, information regarding the nearest source of supply may be obtained by telephoning or writing to your county agricultural agent, State agricultural experiment station, or State department of agriculture.

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